ABSTRACT

A system and method for state space control of solenoids, particularly engine valve solenoids with two latching positions. A collection of trajectories are computed or measured, having low-impact landings with latching from different initial energies. The trajectories define flux linkage and electric current functions of the two variables, position and velocity. These tracking functions define future projections based on present inputs. In operation, the controller monitors position, velocity, flux linkage, and current, uses the functions to compute future current and flux linkage, and adjusts the drive voltage to hit the future flux linkage target, causing the system to track a precomputed trajectory to successful landing. An array of tracking functions incorporates varying valve flow influences and corrective actuation. Drift from a precomputed trajectory indicates an unanticipated valve flow influence and a new tracking function selection, leading to course corrections anticipating flow influences.